

## CLAIMS

WHAT IS CLAIMED IS:

- 5 1. An apparatus for exposing only a selected portion of a length of optical fiber to a hydrogen atmosphere loading process, the apparatus comprising:
  - a) a loading chamber that encloses at least the selected portion of the optical fiber and contains a hydrogen atmosphere; and
  - b) at least one heating element that regionally heats the hydrogen atmosphere
- 10 2. The apparatus of claim 1, wherein the heating element heats the hydrogen atmosphere to a temperature of at least 250 °C.
3. The apparatus of claim 1, wherein the loading chamber is a pressure chamber capable of containing a pressurized atmosphere.
- 15 4. The apparatus of claim 1, wherein the chamber is designed to contain pressures up to 3,000 psi.
5. The apparatus of claim 1, wherein the loading chamber encloses only the selected portion of a continuous length of optical fiber.
- 20 6. The apparatus of claim 1, wherein the loading chamber comprises a first tube concentrically surrounding only the selected portion of the optical fiber.
7. The apparatus of claim 1, further comprising gas seals positioned at ends of the first tube, which contain the hydrogen atmosphere while allowing passage of the length of optical fiber.
8. The apparatus of claim 1, further comprising gas seals attached to end sections of the
- 25 selected portion of the optical fiber.
9. The apparatus of claim 1, further comprising cooling tubes attached to ends of the first tube, wherein the cooling tubes define cooling areas and the cooling tubes include seals that separate the cooling areas from the loading chamber.



22. The apparatus of claim 1, wherein at least one pressure seal adapted to help contain a hydrogen atmosphere within the loading chamber is physically affixed to the optical fiber.

23. The apparatus of claim 1, wherein the pressure seal comprises a curable elastomer.

5 24. The apparatus of claim 1, wherein the at least one pressure seal is located at a boundary between the selected portion of the optical fiber and a non-selected portion.

25. The apparatus of claim 1, further comprising at least one re-closable seal that is in contact with the optical fiber when the hydrogen atmosphere is contained in the loading chamber.

10 26. The apparatus of claim 1, wherein the at least one re-closable seal is located at a boundary between the selected portion of the optical fiber and a non-selected portion.

27. The apparatus of claim 1, wherein the at least one re-closable seal comprises an elastomeric collet.

15 28. An in-line apparatus for producing a grating in an optical fiber, comprising an optical fiber phosensitizing apparatus for selectively exposing only a selected portion of an optical fiber to a hydrogen atmosphere loading process, the apparatus comprising:

a) a loading chamber that encloses at least the selected portion of the optical fiber and contains a high-temperature hydrogen atmosphere; and

20 b) a heating region that locally heats the hydrogen atmosphere surrounding the selected portion to at least 250°C.

29. The apparatus of claim 1, further comprising a mechanism for advancing the selected portion of the optical fiber out of the loading chamber after loading has been completed.

25 30. The apparatus of claim 1, wherein the advancing mechanism permits advancing a second selected portion of the optical fiber into the loading chamber after loading of the selected portion has been completed.